APPENDIX A

MANURE CONTROL ALTERNATIVES FOR OPEN FEEDLOTS

Introduction: Water pollution control requirements for animal feeding operations are given in Chapter 65 of the rules of the Iowa department of natural resources. Under these rules, open feedlots meeting the operation permit application requirements of rule 567—65.4(455B) must also comply with the minimum manure control requirements of subrule 65.2(2). Subrule 65.2(2) requires that all feedlot runoff and other manure flows resulting from precipitation events less than or equal to the 25-year, 24-hour rainfall event be collected and land applied.

This appendix describes five feedlot runoff control systems that meet the requirements of subrule 65.2(2). The systems differ in the volume of manure storage provided and in the frequency of manure application. In general, the time interval between required applications increases with increased storage volume.

A feedlot operator who constructs and operates a manure control facility in accordance with the requirements of any of these five systems will not have additional manure control requirements imposed, unless manure discharges from the facility cause state water quality standards violations. In describing the five systems, the major features of each are first reviewed, followed by detailed information on the construction and operation requirements of the system. The system descriptions are presented in this appendix as follows:

SYSTEM 1: ONE MANURE APPLICATION PERIOD PER YEAR

MAJOR SYSTEM FEATURES:

– Adequate capacity must be provided to collect and store the average annual runoff from all feedlot and nonfeedlot areas which drain into the manure control system (additional storage is required if process waters or manure from other sources also drain into the control system).

– Collected manure must be removed from the control system and land applied at least once annually (interval between successive applications cannot exceed 12 months).

DETAILED SYSTEM REQUIREMENTS:

Manure Control System: The manure control system must be constructed to meet or exceed the following requirements:

1. Solids Settling Facilities: Manure solids settling facilities which meet or exceed the requirements of subrule 65.2(1) must precede the feedlot runoff control system.

2. Feedlot Runoff Control System: The feedlot runoff control system shall, as a minimum, have adequate capacity to store the total wastewater volume determined by summing the following:

   A. The volume determined by multiplying the unpaved feedlot area which drains into the control system by the appropriate runoff value from Figure 1.

   B. The volume determined by multiplying the paved feedlot area which drains into the control system by 1.5 times the appropriate runoff value from Figure 1.

   C. The volume determined by multiplying the total area of cropland, pasture and woodland draining into the control system by the greater of the following:

   – The amount of runoff expected from these areas as a result of the 25-year, 24-hour precipitation event.*

   – The average annual runoff expected from these areas.*

   D. The volume determined by multiplying the total roof, farmstead, and driveway area draining into the control system by the average annual runoff expected from these areas.*

   E. The volume of process wastewater which drains into the control system during a 12-month period.

   F. The volume of manure from other sources which discharges into the control system during a 12-month period.

*Expected 25-year, 24-hour and average annual runoff values shall be determined using runoff prediction methodologies of the U.S. Soil Conservation Service (or equivalent methodologies).

Manure Application Requirements: Manure must be removed from the manure control system and land applied in accordance with the following requirements:

1. Solids Settling Facilities: Collected solids must be removed from the solids settling facilities as necessary to maintain adequate capacity to handle future runoff events. As a minimum, solids shall be removed at least once annually.

2. Feedlot Runoff Control System: Accumulated manure shall be removed from the feedlot runoff control system and disposed of by land application at least once annually. The interval between successive application periods shall not exceed 12 months.

During application periods, land application shall be conducted at rates sufficient to ensure complete removal of accumulated manure from the runoff control system in ten or fewer application days. Manure removal is considered complete when the manure remaining in the runoff control system occupies less than 10 percent of the system's design manure storage volume.

Land application of manure shall be conducted on days when weather and soil conditions are suitable. Weather and soil conditions are normally considered suitable for manure application if:

– Land application areas are not frozen or snow-covered.

– Temperatures during application are greater than 32 degrees Fahrenheit.

– Precipitation has not exceeded 0.05 inch per day for each of the three days immediately preceding application and no precipitation is occurring on the day of application.

SYSTEM 2: JULY AND NOVEMBER MANURE APPLICATION

MAJOR SYSTEM FEATURES:

– Adequate capacity must be provided to collect and store the average runoff expected to occur over the eight-month period from December 1 through July 31 from all feedlot and nonfeedlot areas which drain into the manure control system (additional storage is required if process waters or manure from other sources also drain into the control system).

– Collected manure may be removed from the control system and land applied during any period of the year that conditions are suitable. While application during other periods will minimize the need for July and November application, sufficient manure must still be disposed of during July and November to reduce the volume of manure remaining in the control system during these months to less than 10 percent of the system's design manure storage volume.

DETAILED SYSTEM REQUIREMENTS:

Manure Control System: The manure control system must be constructed to meet or exceed the following requirements:

1. Solids Settling Facilities: Manure solids settling facilities which meet or exceed the requirements of subrule 65.2(1) must precede the feedlot runoff control system.

2. Feedlot Runoff Control System: The feedlot runoff control system shall, as a minimum, have adequate capacity to store the total wastewater volume determined by summing the following:

   A. The volume determined by multiplying the unpaved feedlot area which drains into the control system by the appropriate runoff value from Figure 2.

   B. The volume determined by multiplying the paved feedlot area which drains into the control system by 1.5 times the appropriate runoff value from Figure 2.

C. The volume determined by multiplying the total area of cropland, pasture and woodland draining into the control system by the greater of the following:

– The amount of runoff expected from these areas as a result of the 25-year, 24-hour precipitation event.*

– The average runoff expected to occur from these areas during the eight-month period from December 1 to July 31.*

D. The volume determined by multiplying the total roof, farmstead and driveway area draining into the control system by the average runoff expected to occur from these areas during the eight-month period from December 1 to July 31.*

E. The volume of process wastewater which drains into the control system during the eight-month period from December 1 through July 31.

F. The volume of manure from other sources which discharges into the control system during the eight-month period from December 1 through July 31.

*Expected 25-year, 24-hour runoff and average runoff for the eight-month period December 1 through July 31 shall be determined using runoff prediction methodologies of the U.S. Soil Conservation Service (or equivalent methodologies).

Manure Application Requirements: Manure must be removed from the manure control system and land applied in accordance with the following requirements:

1. Solids Settling Facilities: Collected solids must be removed from the solids settling facilities as necessary to maintain adequate capacity to handle future runoff events. As a minimum, solids shall be removed at least once annually.

2. Feedlot Runoff Control System:

A. A feedlot operator must comply with the following manure application requirements if application operations are limited to the months of July and November.

During these months, land application shall be conducted at rates sufficient to ensure complete removal of accumulated manure from the runoff control system in ten or fewer application days. Manure removal is considered complete when the manure remaining in the runoff control system occupies less than 10 percent of the system's design manure storage capacity.

During July and November, manure application operations shall be initiated on the first day that conditions are suitable for land application of manure, and application must continue on subsequent days that suitable conditions exist. If unfavorable weather conditions prevent complete application of manure to be accomplished during July or November, application must be continued into the following month. Manure application operations may cease when complete application has been achieved.

Weather and soil conditions are normally considered suitable for land application of manure if:

– Land application areas are not frozen or snow-covered.

– Temperatures during application are greater than 32 degrees Fahrenheit.

– Precipitation has not exceeded 0.05 inch per day for each of the three days immediately preceding application and no precipitation is occurring on the day of application.

B. A feedlot operator may dispose of accumulated manure during any period of the year that conditions are suitable. While application during other periods will minimize the need for application during July and November, the feedlot operator will still need to dispose of sufficient manure during July and November to reduce the manure volume remaining in the runoff control system during these months to less than 10 percent of the system's design manure storage capacity.

A feedlot operator who does not limit manure application operations to the months of July and November is not required to comply with the specific manure application requirements which apply when application is limited to those months. However, this does not relieve the feedlot operator of the responsibility to conduct application operations at rates and times which are sufficient to ensure that the manure volume remaining in the runoff control system during July and November will be reduced to less than 10 percent of the system's design manure storage capacity.

SYSTEM 3: APRIL, JULY AND NOVEMBER MANURE APPLICATION

MAJOR SYSTEM FEATURES:

– Adequate capacity must be provided to collect and store the average runoff expected to occur during the five-month period from December 1 through April 30 from all feedlot and nonfeedlot areas which drain into the manure control system (additional storage is required if process waters or manure from other sources also drain into the control system).

– Collected manure may be removed from the control system and land applied during any period of the year that conditions are suitable. While application during other periods will minimize the need for application during the specified application months, sufficient manure must still be disposed of during April, July and November to reduce the volume of manure remaining in the control system during these months to less than 10 percent of the system's design manure storage volume.

DETAILED SYSTEM REQUIREMENTS:

Manure Control System: The manure control system must be constructed to meet or exceed the following requirements:

1. Solids Settling Facilities: Manure solids settling facilities which meet or exceed the requirements of subrule 65.2(1) must precede the feedlot runoff control system.

2. Feedlot Runoff Control System: The feedlot runoff control system shall, as a minimum, have adequate capacity to store the total wastewater volume determined by summing the following:

A. The volume determined by multiplying the unpaved feedlot area which drains into the control system by the appropriate runoff value from Figure 3.

B. The volume determined by multiplying the paved feedlot area which drains into the control system by 1.5 times the appropriate runoff value from Figure 3.

C. The volume determined by multiplying the total area of cropland, pasture and woodland draining into the control system by the greater of the following:

– The amount of runoff expected from these areas as a result of the 25-year, 24-hour precipitation event.*

– The average annual runoff expected to occur from these areas during the five-month period from December 1 to April 30.*

D. The volume determined by multiplying the total roof, farmstead, and driveway area draining into the control system by the average runoff expected to occur from these areas during the five-month period from December 1 to April 30.*

E. The volume of process wastewater which drains into the control system during the five-month period from December 1 through April 30.

F. The volume of manure from other sources which discharges into the control system during the five-month period from December 1 through April 30.

*Expected 25-year, 24-hour runoff and average runoff for the five-month period December 1 through April 30 shall be determined using runoff prediction methodologies of the U.S. Soil Conservation Service (or equivalent methodologies).

Manure Application Requirements: Manure must be removed from the manure control system and land applied in accordance with the following requirements:

1. Solids Settling Facilities: Collected solids must be removed from the solids settling facilities as necessary to maintain adequate capacity to handle future runoff events. As a minimum, solids shall be removed at least once annually.

2. Feedlot Runoff Control System:

A. A feedlot operator must comply with the following manure application requirements if application operations are limited to the months of April, July and November.

During these months, land application shall be conducted at rates sufficient to ensure complete removal of accumulated manure from the runoff control system in ten or fewer application days. Manure removal is considered complete when the manure remaining in the runoff control system occupies less than 10 percent of the system's design manure storage capacity.

During April, July and November, manure application operations shall be initiated on the first day that conditions are suitable for land application of manure, and application must continue on subsequent days that suitable conditions exist. If unfavorable weather conditions prevent complete application of manure to be accomplished during any of these months, manure application must be continued into the following month. Manure application operations may cease when complete application has been achieved.

Weather and soil conditions are normally considered suitable for land application of manure if:

– Land application areas are not frozen or snow-covered.

– Temperatures during application are greater than 32 degrees Fahrenheit.

– Precipitation has not exceeded 0.05 inch per day for each of the three days immediately preceding application and no precipitation is occurring on the day of application.

B. A feedlot operator may dispose of accumulated manure during any period of the year that conditions are suitable. While application during other periods will minimize the need for application during April, July and November, the feedlot operator will still need to dispose of sufficient manure during July and November to reduce the manure volume remaining in the runoff control system during these months to less than 10 percent of the system's design manure storage capacity.

A feedlot operator who does not limit manure application operations to the months of April, July and November is not required to comply with the specific manure application requirements which apply when application is limited to those months. However, this does not relieve the feedlot operator of the responsibility to conduct application operations at rates and times which are sufficient to ensure that the manure volume remaining in the runoff control system during April, July and November will be reduced to less than 10 percent of the system's design manure storage capacity.

SYSTEM 4: APPLICATION AFTER EACH SIGNIFICANT PRECIPITATION EVENT

MAJOR SYSTEM FEATURES:

– Adequate capacity must be provided to collect and store the runoff expected to occur as a result of the 25-year, 24-hour precipitation event from all feedlot and nonfeedlot areas which drain into the manure control system (additional storage is required if process waters or manure from other sources also drain into the control system).

– Collected manure must be removed from the control system and land applied whenever the available (unoccupied) storage capacity remaining in the control system is less than 90 percent of that needed to store runoff from the 25-year, 24-hour storm-land application must begin on the first day that conditions are suitable and must continue until application is completed.

DETAILED SYSTEM REQUIREMENTS:

Manure Control System: The manure control system must be constructed to meet or exceed the following requirements:

1. Solids Settling Facilities: Manure solids settling facilities which meet or exceed the requirements of subrule 65.2(1) must precede the feedlot runoff control system.

2. Feedlot Runoff Control System: The feedlot runoff control system shall, as a minimum, have adequate capacity to store the total wastewater volume determined by summing the following:

   A. The volume determined by multiplying the total feedlot area which drains into the control system by the amount of runoff expected to occur from this area as a result of the 25-year, 24-hour precipitation event.*

   B. The volume determined by multiplying the total area of cropland, pasture and woodland draining into the control system by the amount of runoff expected to occur from these areas as a result of the 25-year, 24-hour precipitation event.*

   C. The volume determined by multiplying the total roof, farmstead and driveway area draining into the control system by the amount of runoff expected to occur from these areas as a result of the 25-year, 24-hour precipitation event.*

   D. The volume of process wastewater which drains into the control system during the five-month period from December 1 through April 30.

   E. The volume of manure from other sources which discharges into the control system during the five-month period from December 1 through April 30.

*Expected 25-year, 24-hour runoff shall be determined by using runoff prediction methodologies of the U.S. Soil Conservation Service (or equivalent methodologies).

Manure Application Requirements: Manure must be removed from the manure control system and land applied in accordance with the following requirements:

1. Solids Settling Facilities: Collected solids must be removed from the solids settling facilities as necessary to maintain adequate capacity to handle future runoff events. As a minimum, solids shall be removed at least once annually.

2. Feedlot Runoff Control System: Accumulated manure shall be removed from the feedlot runoff control system and disposed of by land application following each precipitation or snowmelt runoff event which results in significant manure accumulations in the control system. Manure accumulations will be considered significant whenever the available (unoccupied) storage capacity remaining in the control system is less than 90 percent of that required to store the runoff from the 25-year, 24-hour storm.

Once the available storage capacity remaining in the manure control system is reduced to the point that manure application is necessary, manure application operations must be initiated on the first day that conditions are suitable for land application of manure, and application must continue on subsequent days that suitable conditions exist. Application operations may cease when the storage capacity available in the control system has been restored to greater than 90 percent of that required to store runoff from the 25-year, 24-hour storm.

During application periods, land application shall be conducted at rates sufficient to ensure complete removal of accumulated manure from the control system in ten or fewer application days.

Weather and soil conditions are normally considered suitable for land application of manure if:

– Land application areas are not frozen or snow-covered.

– Temperatures during application are greater than 32 degrees Fahrenheit.

– Precipitation has not exceeded 0.05 inch per day for each of the three days immediately preceding application and no precipitation is occurring on the day of application.

SYSTEM 5: APRIL/MAY AND OCTOBER/NOVEMBER APPLICATION

MAJOR SYSTEM FEATURES:

– Adequate capacity must be provided to collect and store the average runoff expected to occur over the eight-month period from October 1 through May 31 from all feedlot and nonfeedlot areas which drain into the manure control system (additional storage is required if process waters or manure from other sources also drain into the control system).

– Collected manure may be removed from the control system and land applied during any period of the year that conditions are suitable. While application during other periods will minimize the need for application during the April/May and the October/November periods, sufficient manure must still be disposed of during each of these two-month periods to reduce the volume of manure remaining in the control system during these periods to less than 10 percent of the system's design manure storage volume.

DETAILED SYSTEM REQUIREMENTS:
Manure Control System: The manure control system must be constructed to meet or exceed the following requirements:

1. Solids Settling Facilities: Manure solids settling facilities which meet or exceed the requirements of subrule 65.2(1) must precede the feedlot runoff control system.

2. Feedlot Runoff Control System: The feedlot runoff control system shall, as a minimum, have adequate capacity to store the total wastewater volume determined by summing the following:

   A. The volume determined by multiplying the unpaved feedlot area which drains into the control system by the appropriate runoff value from Figure 4.

   B. The volume determined by multiplying the paved feedlot area which drains into the control system by 1.5 times the appropriate runoff value from Figure 4.

   C. The volume determined by multiplying the total area of cropland, pasture and woodland draining into the control system by the greater of the following:

   – The amount of runoff expected from these areas as a result of the 25-year, 24-hour precipitation event.*

   – The average runoff expected to occur from these areas during the eight-month period from October 1 to May 31.*

   D. The volume determined by multiplying the total roof, farmstead, and driveway draining into the control system by the average runoff expected to occur from these areas during the eight-month period from October 1 to May 31.*

   E. The volume of process wastewater which drains into the control system during the eight-month period from October 1 through May 31.

   F. The volume of manure from other sources which discharges into the control system during the eight-month period from October 1 through May 31.

*Expected 25-year, 24-hour runoff and average runoff for the eight-month period October 1 through May 31 shall be determined using runoff prediction methodologies of the U.S. Soil Conservation Service (or equivalent methodologies).

Manure Application Requirements: Manure must be removed from the manure control system and land applied in accordance with the following requirements:

1. Solids Settling Facilities: Collected solids must be removed from the solids settling facilities as necessary to maintain adequate capacity to handle future runoff events. As a minimum, solids shall be removed at least once annually.

2. Feedlot Runoff Control System: At a minimum, accumulated manure shall be removed from the feedlot runoff control system and disposed of by land application during the periods April 1 through May 31 and October 1 through November 30.

During each of these periods, land application shall be conducted at rates sufficient to ensure complete removal of accumulated manure from the runoff control system in ten or fewer application days. Manure removal is considered complete when the manure remaining in the runoff control system occupies less than 10 percent of the system's design manure storage capacity.

A feedlot operator may dispose of accumulated manure during any period of the year that conditions are suitable. While application during other periods will minimize the need for application during the April/May and October/November periods, the feedlot operator will still need to dispose of sufficient manure during these periods to reduce the manure volume remaining in the runoff control system during these periods to less than 10 percent of the system's design manure storage capacity.

Land application of manure shall be conducted on days when weather and soil conditions are suitable. Weather and soil conditions are normally considered suitable for manure application if:

– Land application areas are not frozen or snow-covered.

– Temperatures during application are greater than 32 degrees Fahrenheit.

– Precipitation has not exceeded 0.05 inch per day for each of the three days immediately preceding application and no precipitation is occurring on the day of application.

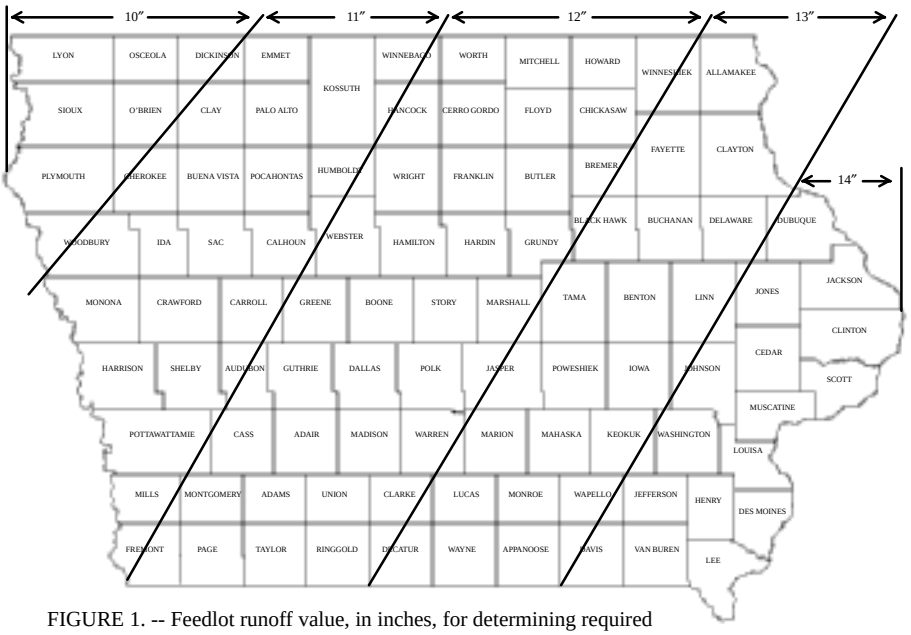

FIGURE 1. -- Feedlot runoff value, in inches, for determining required capacity of the "One Manure Application Per Year" manure control system.

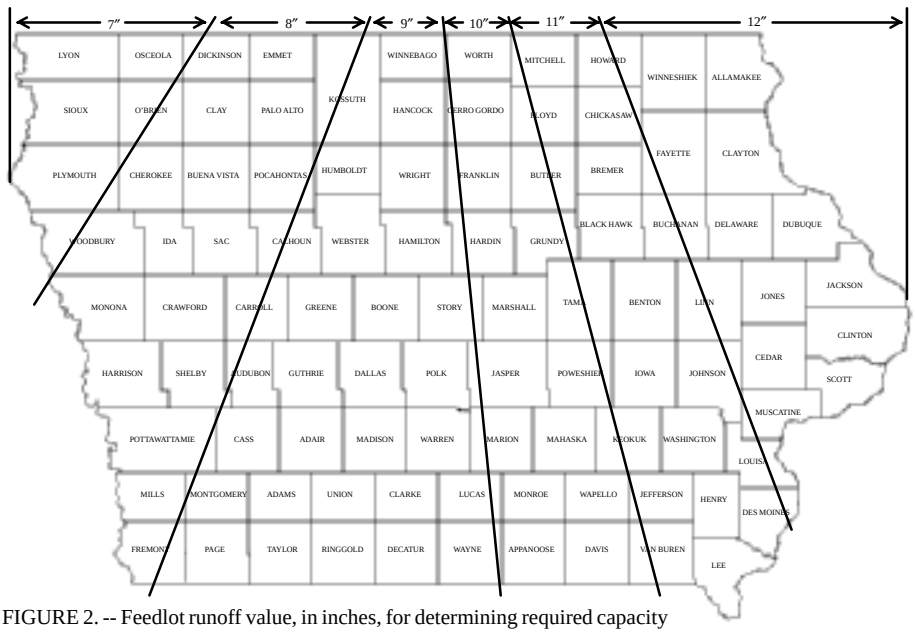

FIGURE 2. -- Feedlot runoff value, in inches, for determining required capacity of the "July and November Manure Application" manure control system.

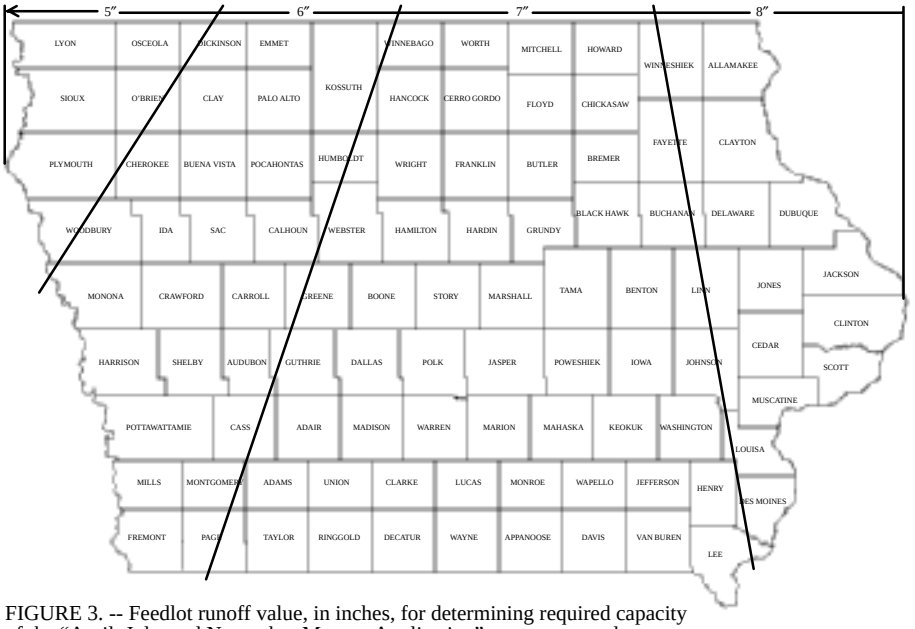

FIGURE 3. -- Feedlot runoff value, in inches, for determining required capacity of the "April, July, and November Manure Application" manure control system.

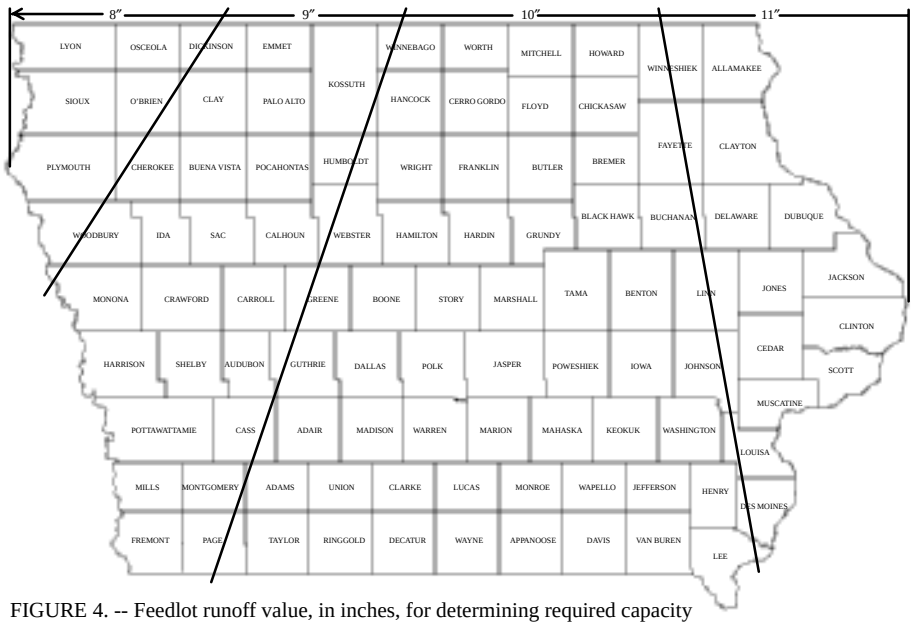

FIGURE 4. -- Feedlot runoff value, in inches, for determining required capacity of the "April/May and October/November Manure Application" manure control system.

APPENDIX B
LAND DISPOSAL OF ANIMAL MANURE

Rescinded IAB 2/14/96, effective 3/20/96

TABLE 1
Major Water Sources—Rivers and Streams

County	River/Stream	Location
Adair	Middle Nodaway River	Adams/Adair Line to Hwy. 92
	Middle River	All
	West Fork-Middle Nodaway	Mouth to County Road N51
Adams	East Nodaway River	Adams/Taylor Line to County Road H24
	Middle Nodaway River	All
Allamakee	Bear Creek	Mouth, S1, T99N, R6W to West Line S30, T100N, R6W
	Mississippi River	All
	Paint Creek	Mouth to road crossing in S18, T97N, R4W
	Upper Iowa River	Mouth, S36, T100N, R4W to West Line S31, T100N, R6W
	Village Creek	Mouth, S33, T99N, R3W, upstream to Confluence with Unnamed Creek in S23, T98N, R4W
	Waterloo Creek	Mouth, S35, T100N, R6W to North Line S8, T100N, R6W
	Yellow River	Mouth, S34, T96N, R3W to Confluence with Upper Branch Yellow River, S4, T96N, R6W
Appanoose	Chariton River	Missouri Line to Rathbun Dam
	South Chariton River	Appanoose/Wayne Line to Rathbun Lake
Benton	Bear Creek	North County Line to Mouth at Cedar River, S21, T86N, R10W
	Cedar River	All
	Iowa River	All
	Opossum Creek	SE ¼ S5, T84N, R9W to East County Line
	Prairie Creek 2	Road Crossing N ½ S24, T83N, R12W to Benton/Linn Line
	Wolf Creek	All

Black Hawk	Beaver Creek	Mouth, S34, T90N, R14W to West County Line, S31, T90N, R14W
	Black Hawk Creek	Mouth, S22, T89N, R13W to West County Line S6, T87N, R14W
	Buck Creek	All
	Cedar River	All
	Crane Creek	Mouth to North County Line
	Miller's Creek	Mouth to West Line, S5, T87N, R12W
	Shell Rock River	Mouth, S4, T90N, R14W to North County Line, S4, T90N, R14W
	Spring Creek	Mouth to Confluence with Little Spring Creek, S11, T87N, R11W
	Wapsipinicon River	All
	West Fork Cedar River	All
	Wolf Creek	Mouth, S19, T87N, R11W to South County Line
Boone	Beaver Creek	West Line of S10, T82N, R28W to South County Line
	Des Moines River	All
	Squaw Creek	West Line of S8, T85N, R25W to East County Line
Bremer	Cedar River	All
	Crane Creek	South County Line to North Line, S9, T91N, R12W
	East Fork Wapsipinicon River	Mouth to North County Line
	Little Wapsipinicon River	East County Line to North Line, S2, T92N, R11W
	Quarter Section Run	Mouth to West Line, S35, T91N, R13W
	Shell Rock River	All
	Wapsipinicon River	All
Buchanan	Buck Creek	Mouth to West County Line
	Buffalo Creek	Mouth to Confluence of East and West Branches, S35, T90N, R8W
	Little Wapsipinicon River	Mouth to North County Line
	Otter Creek	Mouth to Confluence with Unnamed Creek, S9, T90N, R9W
	Wapsipinicon River	All
Buena Vista	Little Sioux River	All
	North Raccoon River	South County Line to North Line of S15, T91N, R36W

Butler	Beaver Creek	All
	Boylan Creek	Mouth to North Line, S23, T92N, R18W
	Coldwater Creek	Mouth to West Line S5, T93N, R17W
	Flood Creek	Mouth to North County Line
	Hartgrave Creek	Mouth to West County Line
	Johnson Creek	West County Line to Confluence with Beaver Creek
	Maynes Creek	West County Line to Mouth at West Fork of Cedar River
	Shell Rock River	All
	South Beaver Creek	Mouth to South County Line
	West Fork Cedar River	All
Calhoun	Lake Creek	Mouth to North Line S25, T87N, R33W
	Cedar Creek	South County Line to Confluence with West Cedar Creek
	Camp Creek	Mouth to West Line S25, T87N, R34W
	North Raccoon River	All
Carroll	Middle Raccoon River	South County Line to West Line of S23, T84N, R35W
	North Raccoon River	All
Cass	East Nishnabotna River	All
Cedar	Cedar River	All
	Rock Creek	Road Crossing North Line S1, T81N, R3W to Mouth at Cedar River
	Sugar Creek	Road Crossing North Line S29, T81N, R2W to South County Line
	Wapsipinicon River	All
Cerro Gordo	Beaverdam Creek	I-35 to Franklin County Line
	E Branch - Beaverdam Creek	Hwy. 65 to Mouth at Beaverdam Creek
	Shell Rock River	All
	Spring Creek	County Road B15 to Mouth at Winnebago River
	Willow Creek	Hwy. 18 to Mouth at Winnebago River
	Winnebago River	All

Cherokee	Grey Creek	North Line of S22, T93N, R40W to Mouth at Mill Creek
	Little Sioux River	All
	Maple River	North Line of S5, T90N, R39W to Ida County Line
	Mill Creek	North Line S13, T93N, R41W to Mouth at Little Sioux River
	Perry Creek	North Line of S5, T91N, R40W to Mouth at Little Sioux River
	Rock Creek	East Line of S4, T91N, R41W to Mouth at Little Sioux River
	Silver Creek	Mouth to North Line of S34, T90N, R40W
	West Fork, Little Sioux River	North Line of S12, T92N, R42W to Plymouth County Line
	Willow Creek	North Line S30, T91N, R41W to Mouth at Little Sioux River
Chickasaw	Cedar River	All
	Crane Creek	All
	East Fork Wapsipinicon River	South County Line to Confluence with Plum Creek, S16, T95N, R12W
	Little Cedar River	All
	Little Turkey River	All
	Little Wapsipinicon River	Mouth to North County Line
	Wapsipinicon River	All
Clay	Little Sioux River	All
	Ocheyedan River	All
Clayton	Bloody Run	Mouth, S15, T95N, R3W, upstream to second road bridge crossing the stream in the western portion of Basil Giard Claim No. 1
	Elk Creek	Mouth to Steeles Branch, S26, T91N, R4W
	Maquoketa River	South County Line to North Line S31, T91N, R6W
	Robert's Creek	Mouth to Confluence with Silver Creek, S17, T94N, R5W
	Sny Magill Creek	Mouth, S23, T94N, R3W upstream to Confluence with North Cedar Creek, S8, T94N, R3W
	Turkey River	All
	Volga River	All

Clinton	Brophys Creek	South Line of S4, T81N, R5E to Mouth at the Wapsipinicon River
	Drainage Ditch 12	West Line of S30, T82N, R2E to Mouth at the Wapsipinicon River
	Elk River	South Line of S5, T83N, R6E to Mouth at the Mississippi River
	Harts Mill Creek	East Line of S8, T81N, R6E to Mouth at Mill Creek
	Mill Creek	South Line of S14, T81N, R6E to Mouth with Mississippi River
	Mississippi River	All
	Silver Creek	South Line of S22, T82N, R3E to S6, T80N, R4E
	Wapsipinicon River	All
Crawford	Boyer River	All
	Soldier River	All
Dallas	Beaver Creek	All
	Des Moines River	All
	Middle Raccoon River	All
	Raccoon River	All
	South Raccoon River	All
Davis	Des Moines River	All
Decatur	Long Creek	DeKalb Wildlife Area to Mouth at the Thompson River
	Thompson River	All
	Weldon River	Missouri Border to Hwy. 2
Delaware	Buffalo Creek	All
	Coffin's Creek	Mouth to Road Crossing, Center of S26, T89N, R6W
	Maquoketa River	All
	North Fork Maquoketa River	All
	Plum Creek	Mouth to Confluence with Penn's Br., S18, T88N, R3W
	South Fork Maquoketa River	Mouth to West County Line

Des Moines	Brush Creek	South Line of S5, T69N, R3W to Mouth at the Skunk River
	Cedar Fork Creek	West Line of S31, T72N, R3W to Mouth at the Flint River
	Dolbee Creek	East Line of S24, T72N, R2W to S31, T71N, R1W
	Flint River	County Line to Mouth at the Mississippi River
	Knotty Creek	East Line of S25, T71N, R3W to the Mouth at the Flint River
	Hawkeye Creek	North Line of S30, T72N, R3W to Mouth at the Mississippi River
	Long Creek	South Line of S3, T69N, R4W to the Mouth at the Skunk River
	Mississippi River	All
	Skunk River	All
	Spring Creek	South Line of S15, T69N, R3W to Mouth at the Mississippi River
	Tributary to Flint River	South Line of S27, T71N, R3W to Mouth at the Flint River
Dickinson	Little Sioux River	All
	Milford Creek	S12, T98N, R37W to Mouth at Little Sioux River
	West Branch, Little Sioux River	South Line of S27, Tl00N, R38W to Mouth at West Fork of Little Sioux River
	West Fork, Little Sioux River	South Line of S24, T100N, R38W to Mouth at Little Sioux River
Dubuque	Catfish Creek	Mouth to North Line S16, T88N, R2E
	Little Maquoketa River	Mouth to Confluence with North Fork Little Maquoketa River, S31, T90N, R1E
	Lytle Creek	South County Line to Confluence with Buncombe Creek, S19, T87N, R2E
	Mississippi River	All
	North Fork Little Maquoketa River	Mouth to Confluence with Middle Fork Little Maquoketa River, S35, T90N, R1E
	North Fork, Maquoketa River	South County Line to Confluence with Hewitt Creek, Sec. 29, T89N, R2W
	Whitewater Creek	South County Line to Confluence with John’s Creek, S25, T87N, R1W
Emmet	East Fork, Des Moines River	Tuttle Lake Outlet to East County Line
	West Fork, Des Moines River	All

Fayette	Little Turkey River	Mouth, S18, T95N, R8W to North Line S5, T95N, R10W
	Little Wapsipinicon River	All
	Turkey River	All
	Volga River	East County Line to Confluence with Little Volga River, S2, T92N, R9W
Floyd	Cedar River	All
	Flood Creek	South County Line to Road Crossing, S32, T96N, R17W
	Little Cedar River	All
	Rock Creek	Mouth, S24, T97N, R17W to North County Line
	Shell Rock River	All
	Winnebago River	All
Franklin	Bailey Creek	South Line of S13, T93N, R20W to Mouth at the West Fork, Cedar River
	Beaverdam Creek	North County Line to Mouth at the West Fork, Cedar River
	Hartgraves Creek	South Line of S28, T92N, R19W to East County Line
	Iowa River	All
	Maynes Creek	East Line of S30, T91N, R20W to East County Line
	Otter Creek	East Line of S31, T93N, R20W to Mouth at Hartgraves Creek
	Spring Creek	Beeds Lake Outlet to Mouth at Otter Creek
	West Fork, Cedar River	East Line of S19, T93N, R19W to East County Line
Fremont	East Nishnabotna River	Mouth at Nishnabotna River to East County Line
	Missouri River	All
	Nishnabotna River	Missouri/Iowa Line to South Line of S25, T68N, R41W
	West Nishnabotna River	Mouth at Nishnabotna River to North County Line
Greene	Buttrick Creek	Mouth to North County Line
	Cedar Creek	Mouth at North Raccoon River to North County Line
	North Raccoon River	All

Grundy	Black Hawk Creek	East Line of S35, T88N, R17W to Black Hawk County Line
	North Black Hawk Creek	NE ¼ S8, T88N, R15W to Mouth
	South Beaver Creek	E ½ of S3, T88N, R18W to Butler County Line
	Wolf Creek	N ½ of S31, T86N, R17W to Tama County Line
Guthrie	Brushy Creek	Mouth to North Line of S35, T81N, R33W (County Road F24)
	Middle Raccoon River	All
	Middle River	South County Line to County Road N54
	Mosquito Creek	S36, T81N, R32W to Hwy. 4, S17, T81N, R30W
	South Raccoon River	East County Line to County Road F32
	Willow Creek	Mouth to North County Line
Hamilton	Boone River	All
	Brewers Creek	Mouth at Boone River to County Road R27
	Eagle Creek	Mouth at Boone River to Wright County Line
	Skunk River	South County Line to County Road D41
	White Fox Creek	Mouth at Boone River to Wright County Line
Hancock	East Fork, Iowa River	South County Line to Hwy. 18
	West Fork, Iowa River	South County Line to County Road B55
	Winnebago River	All
Hardin	Elk Creek	Mouth at Iowa River to County Road D35
	Honey Creek	South County Line to County Road D65
	Iowa River	All
	South Fork, Iowa River	Mouth at Iowa River to Hwy. 359
Harrison	Boyer River	All
	Little Sioux River	All
	Missouri River	All
	Soldier River	All
Henry	Big Creek	North Line of S31, T72N, R5W to S19, T70N, R5W
	Cedar Creek	County Line to Mouth at the Skunk River
	Crooked Creek	All
	East Fork, Crooked Creek	All
	Little Cedar Creek	South County Line to Mouth at Cedar Creek
	Mud Creek	South Line of S15, T70N, R5W to Mouth at the Skunk River
	Skunk River	All

Howard	Crane Creek	South County Line to Hwy. 9
	Little Wapsipinicon River	South County Line to North Line S23, T98N, R14W
	North Branch Turkey River	Mouth to Highway 9
	Turkey River	East County Line to West Line of S1, T98N, R12W
	Upper Iowa River	All
	Wapsipinicon River	All
Humboldt	Des Moines River	South County Line to Confluence of East and West Fork of Des Moines River
	East Fork, Des Moines River	Mouth at the Des Moines River to North County Line
	West Fork, Des Moines River	Mouth at the Des Moines River to West County Line
Ida	Little Sioux River	All
	Maple River	All
Iowa	Bear Creek	West County Line to Mouth at the Iowa River
	Iowa River	All
	North Fork, English River	All
	Old Man Creek	West Line of S35, T79N, R10W to East County Line
Jackson	Bear Creek	Mouth to West County Line
	Big Mill Creek	Confluence with Little Mill Creek, S13, T86N, R4E upstream to West Line S9, T86N, R4E
	Brush Creek	North Line, S23, T85N, R3E upstream to Hwy. 62 bridge in S11, T85N, R3E
	Deep Creek	Mouth to South County Line
	Little Mill Creek	Mouth, S13, T86N, R4E upstream to West Line S23, T86N, R4E
	Lytle Creek	Mouth to North County Line
	Maquoketa River	All
	Mississippi River	All
	North Fork, Maquoketa River	West County Line to Mouth at the Maquoketa River
	Prairie Creek	Mouth to Hwy. 64, S20, R84N, R3E
Jasper	Indian Creek	All
	North Skunk River	All
	South Skunk River	All

Jefferson	Brush Creek	South Line of S18, T72N, R8W to the East County Line
	Cedar Creek	All
	Competine Creek	West County Line to Mouth at Cedar Creek
	Crooked Creek	All
	Skunk River	All
	Walnut Creek	East Line of S22, T73N, R9W to the Mouth at the Skunk River
Johnson	Cedar River	All
	Clear Creek	West County Line to Mouth at the Iowa River
	Iowa River	All
	Old Mans Creek	West County Line to Mouth at the Iowa River
Jones	Buffalo Creek	West County Line to Mouth at the Wapsipinicon River
	Maquoketa River	All
	North Fork, Maquoketa River	All
	Wapsipinicon River	All
	Whitewater Creek	Mouth to North County Line
Keokuk	Bridge Creek	South Line of S23, T76N, R12W to the Mouth at the North Skunk River
	Cedar Creek	East Line of S19, T76N, R13W to the Mouth at the North Skunk River
	North Skunk River	West County Line to Mouth at the Skunk River
	Rock Creek	South Line of S21, T76N, R12W to Mouth at Cedar Creek
	South Fork, English River	All
	South Skunk River	West County Line to Mouth at the Skunk River
	Skunk River	All
Kossuth	Buffalo Creek	West Line of S4, T97N, R27W to Mouth at the East Fork, Des Moines River
	East Fork, Des Moines River	All

Lee	Big Sugar Creek	South Line of S26, T69N, R6W to Mouth at the Mississippi River
	Des Moines River	All
	Little Sugar Creek	South Line of S24, T68N, R7W to Mouth at the Des Moines River
	Lost Creek	South Line of S32, T69N, R4W to Mouth at the Mississippi River
	Mississippi River	All
	Pitman Creek	South Line of S10, T68N, R5W to Mouth at the Mississippi River
	Skunk River	All
Linn	Buffalo Creek	All
	Cedar River	All
	Prairie Creek	West County Line to Mouth at Cedar River
	Wapsipinicon River	All
Louisa	Big Slough Creek	East Line of S7, T74N, R5W to Mouth at Buffington Creek
	Buffington Creek	Mouth to West Line of S18, T74N, R5W
	Cedar River	All
	East Fork Crooked Creek	All
	Goose Creek	West County Line to Mouth at the Iowa River
	Honey Creek	Mouth to East Line of S25, T76N, R5W
	Honey Creek	Mouth to South Line of S32, T73N, R3W (Morning Sun Twp.)
	Indian Creek	Mouth to North Line of S1, T75N, R4W
	Iowa River	All
	Johnny Creek	Mouth to East Line of S6, T74N, R4W
	Long Creek	South Line of S30, T75N, R5W to the Mouth at the Iowa River
	Mississippi River	All
	Muscatine Slough	North County Line to County Road Bridge in S31, T75N, R3W
	Muskrat Lake	S16, T74N, R3W to Mouth at the Iowa River
	Otter Creek	Mouth to South Line of S16, T73N, R4W
	Roff Creek	Mouth to South Line of S36, T73N, R4W
	Short Creek	Mouth to West Line of S6, T75N, R5W
	Smith Creek	Mouth to West and South Lines of S35, T73N, R3W
Lucas	Chariton River	Rathbun Lake to Hwy. 14
Lyon	Big Sioux River	All
	Little Rock River	East County Line to Mouth at Rock River
	Rock River	All

Madison	Clanton Creek	South Line of S32, T75N, R26W to the East County Line
	Middle River	All
	North Branch North River	Mouth to West County Line
	North River	East County Line to East Line of S17, T76N, R28W
	Thompson River	All
Mahaska	Cedar Creek	West County Line to Mouth at Des Moines River
	Des Moines River	All
	North Skunk River	All
	Skunk River	All
Marion	Des Moines River	All
	Skunk River	All
	Whitebreast Creek	West County Line to Mouth at Des Moines River
Marshall	Honey Creek	North County Line to Mouth at Iowa River
	Iowa River	All
	Minerva Creek	NW ¼ S9, T85N, R20W to Mouth at Iowa River
	Timber Creek	County Road Bridge in S24, T83N, R18W to Mouth at Iowa River
Mills	Missouri River	All
	West Nishnabotna River	All
Mitchell	Cedar River	South Line S13, T97N, R17W to North Line S8, T100N, R18W
	Deer Creek	Mouth to West County Line, S6, T99N, R18W
	Little Cedar River	South Line S13, T97N, R15W to North Line S7, T100N, R16W
	Otter Creek	Mouth at S21, T100N, R18W to North Line S11, T100N, R18W
	Rock Creek	South County Line to Road Crossing, West Line S7, T97N, R17W
	Spring Creek	Mouth to North Line of S29, T98N, R16W
	Turtle Creek	Mouth to North Line S7, T99N, R15W
	Wapsipinicon River	East County Line upstream to North Line of S20, T100N, R15W

Monona	Little Sioux River	All
	Maple River	Mouth at Little Sioux River to North County Line
	Missouri River	All
	Soldier River	All
	West Fork, Little Sioux River	Mouth at Little Sioux River to North County Line
Montgomery	East Nishnabotna River	All
	Middle Nodaway River	Mouth at Nodaway River to East County Line
	Nodaway River	All
Muscatine	Cedar River	All
	Mississippi River	All
	Mud Creek	West Line of S5, T78N, R1E to Mouth at Sugar Creek
	Muscatine Slough	South Line of S4, T76N, R2W to South County Line
	Pike Run	South Line of S34, T78N, R3W to S19, T77N, R3W
	Pine Creek	Wildcat Den State Park to Mouth at Mississippi River
	Sugar Creek	North County Line to Mouth at the Cedar River
	Wapsinonoc Creek	North County Line to Mouth at the Cedar River
	Weise Slough	S19, T78N, R3W
O'Brien	Little Sioux River	All
	Ocheyedan River	All
Osceola	Little Rock River	All
	Ocheyedan River	All
Page	East Nishnabotna River	All
	East Nodaway River	East County Line to Mouth at the Nodaway River
	Nodaway River	All
	Tarkio River	Hwy. 2 to South County Line
Palo Alto	Cylinder Creek	Mouth to Confluence with DD#21, S24, T95N, R32W
	Jack Creek	Mouth to West Line of S11, T97N, R33W
	West Fork, Des Moines River	All

Plymouth	Big Sioux River	All
	Floyd River	All
	West Fork, Little Sioux River	All
Pocahontas	Lizard Creek	West Line of S2, T90N, R31W to East County Line
	North Branch Lizard Creek	Mouth to North Line of S6, T91N, R31W
	Pilot Creek	West Line of S9, T92N, R31W to Mouth with the West Fork, Des Moines River
	West Fork, Des Moines River	All
Polk	Beaver Creek	All
	Des Moines River	All
	Four Mile Creek	Mouth to South Line of S1, T80N, R24W
	Indian Creek	All
	North River	All
	Raccoon River	All
	South Skunk River	All
	Walnut Creek	All
Pottawattamie	East Nishnabotna River	All
	Missouri River	All
	West Nishnabotna River	All
Poweshiek	Bear Creek	NW ¼ S8, T80N, R14W to the East County Line
	North Fork, English River	North Line of S23, T79N, R14W to East County Line
	North Skunk River	All
Ringgold	East Fork, Grand River	South County Line to Hwy. 2
	Grand River	South County Line to Hwy. 66
	Platte River	All
	Thompson River	All
Sac	Big Cedar Creek	West Line of S10, T88N, R35W to the Mouth at the North Raccoon River
	Boyer River	West Line of S5, T89N, R37W to South County Line
	Indian Creek	North Line of S7, T87N, R36W to Mouth at the North Raccoon River
	North Raccoon River	All
	Outlet Creek	East Line of S35, T87N, R36W to Mouth at Indian Creek

Scott	Lost Creek	North Line of S32, T80N, R5E to Mouth at the Wapsipinicon River
	Mississippi River	All
	Mud Creek	County Road Bridge in S11, T79N, R1E to Mouth at the Wapsipinicon River
	Wapsipinicon River	All
Sioux	Big Sioux River	All
	Floyd River	Hwy. 18 to South County Line
	Rock River	All
Story	East Indian Creek	Mouth to Highway 30
	Indian Creek	South County Line to Confluence with East and West Branches in S16, T82N, R22W
	Skunk River	All
	Squaw Creek	Mouth to West County Line
	West Indian Creek	Mouth to Highway 30
Tama	Iowa River	All
	Salt Creek	West Line of S28, T84N, R13W to Mouth at the Iowa River
	Wolf Creek	All
Taylor	East Fork, 102 River	Hwy. 49 to South County Line
	Platte River	All
	West Fork, 102 River	Hwy. 2 to South County Line
Union	Platte River	All
	Thompson River	All
Van Buren	Cedar Creek	All
	Des Moines River	All
Wapello	Des Moines River	All
Warren	Clanton Creek	West County Line to Mouth at Des Moines River
	Middle River	West County Line to Mouth at Des Moines River
	North River	All
	South River	All
	Whitebreast Creek	All

Washington	Camp Creek	North Line of S33, T77N, R7W to the Mouth at English River
	Clemons Creek	West Line of S9, T75N, R8W to the South Line S14, T75N, R8W
	Crooked Creek	East Line of S28, T76N, R9W to Henry County Line
	Dutch Creek	South Line of S21, T75N, R9W to the Mouth at the Skunk River
	East Fork, Crooked Creek	All
	English River	All
	Goose Creek	East County Line to East Line of S22, T76N, R6W
	Honey Creek	Lake Darling to Mouth at the Skunk River
	Iowa River	All
	Long Creek	East County Line to West Line of S26, T75N, R6W
	North Fork, Long Creek	East Line of S3, T75N, R7W to Mouth at Long Creek
	Skunk River	All
	Smith Creek	West County Line to Mouth at the English River
	South Fork, Long Creek	County Road H61 to Mouth at Long Creek
	Williams Creek	South County Line to Mouth at East Fork, Crooked Creek
Wayne	Chariton River	All
	South Chariton River	Rathbun Lake to County Road 556
Webster	Brushy Creek	North Line of S8, T88N, R27W to Mouth at the Des Moines River
	Deer Creek	North Line of S16, T90N, R29W to Mouth at the Des Moines River
	Des Moines River	All
	North Branch, Lizard Creek	West County Line to Mouth at Des Moines River
	Prairie Creek	West Line of S29, T88N, R28W to Mouth at the Des Moines River
	South Branch, Lizard Creek	Mouth to West County Line
Winnebago	Winnebago River	All

Winneshiek	Bear Creek	East County Line to County Road A24 in S34, T100N, R15W
	Canoe Creek	East County Line to West Line S8, T99N, R8W
	Little Turkey River	All
	North Bear Creek	Mouth, S25, T100N, R7W upstream to Confluence with Middle Bear Creek in S14, T100N, R7W
	Paint Creek	East Line S13, T99N, R7W to West Line S11, T99N, R7W
	Turkey River	All
	Upper Iowa River	All
Woodbury	Big Sioux River	All
	Floyd River	All
	Little Sioux River	All
	Maple River	All
	Missouri River	All
	West Fork, Little Sioux River	All
Worth	Beaver Creek	Hwy. 9 to Mouth at Winnebago River
	Deer Creek	County Road S56 to East County Line
	Elk Creek	Hwy. 105 to Mouth at Shell Rock River
	Shell Rock River	All
	Willow Creek	Hwy. 9 to Mouth at Winnebago River
	Winans Creek	Hwy. 9 to Mouth at Winnebago River
Wright	Boone River	All
	Eagle Creek	County Road R33 to South County Line
	East Fork, Iowa River	North County Line to Mouth at Iowa River
	Iowa River	South Line of S19, T93N, R23W to East County Line
	Otter Creek	Mouth to West Line S14, T92N, R26W
	West Fork, Iowa River	North County Line to Mouth at Iowa River
	White Fox Creek	County Road R38 to South County Line

TABLE 2
Major Water Sources—Lakes

County	Lake	Location
Adair	Greenfield Lake	1 mile Southwest of Greenfield
	Orient Lake	1 mile Southwest of Orient
	Meadow	6 miles Northeast of Greenfield
	Mormon Trail Lake	1½ miles Southeast of Bridgewater
	Nodaway Lake	2 miles Southwest of Greenfield
Adams	Binder Lake	1 mile Northeast of Corning
	Corning Reservoir	North edge of Corning
	Lake Icaria	4 miles North of Corning
Appanoose	Centerville Reservoir (Upper)	Southwest edge of Centerville
	Centerville Reservoir (Lower)	Southwest edge of Centerville
	Mystic Reservoir	½ mile North of Mystic
	Rathbun Reservoir	8 miles Northwest of Centerville
Audubon	Littlefield	4 miles East of Exira
Benton	Hannen Lake	4 miles Southwest of Blairstown
	Rodgers Park Lake	3½ miles Northwest of Vinton
Black Hawk	Alice Wyth Lake	North edge of Waterloo
	Big Woods Lake	Northwest edge of Cedar Falls
	Cedar Falls Reservoir	North edge of Cedar Falls
	East Lake (Quarry Lake)	North edge of Waterloo
	Fisher Lake	North edge of Waterloo
	George Wyth Lake	North edge of Waterloo
	Green Belt Lake	West edge of Waterloo
	Meyer Lake	Evansdale
	Mitchell Lake	Waterloo
	North Prairie Lake	Southwest edge of Cedar Falls
	South Prairie Lake	Southwest edge of Cedar Falls
Boone	Don Williams Lake	5 miles North of Ogden
	Sturtz	3 miles West of Boone
Bremer	Sweet Marsh (Martens Lake)	1 mile East of Tripoli
	Sweet Marsh (A)	2 miles East of Tripoli
	Waverly Impoundment	Waverly
Buchanan	Fontana Mill	½ mile South of Hazelton
	Independence Impoundment	Independence
	Kounty Pond	2½ miles Southeast of Brandon

Buena Vista	Gustafson Lake	1 mile South of Sioux Rapids
	Newell Pit	1½ miles Northwest of Newell
	Pickerel Lake	7 miles Northwest of Marathon
	Storm Lake	South edge of Storm Lake
Calhoun	Calhoun Wildlife Area	4 miles East of Manson
	Hwy. 4 Recreation Area	1 mile South of Rockwell City
	North Twin Lake	6 miles North of Rockwell City
	South Twin Lake	5 miles North of Rockwell City
Carroll	Swan Lake	3 miles Southeast of Carroll
Cass	Cold Springs Lake	1 mile South of Lewis
	Lake Anita	½ mile South of Anita
Cerro Gordo	Blue Pit	Southwest edge of Mason City
	Clear Lake	South edge of Clear Lake
	Fin and Feather Lake	3 miles South, 1 mile East of Mason City
Cherokee	Larson Lake	2½ miles East, 2 miles North of Aurelia
	Spring Lake	South edge of Cherokee
Chickasaw	Airport Park Lake	S35, T96N, R13W
	Nashua Impoundment	Nashua
	Split Rock Park Lake	5 miles Southwest of Fredericksburg
Clarke	East Lake	½ mile East of Osceola
	West Lake	2 miles West of Osceola
Clay	Elk Lake	3 miles South, 1 mile West of Ruthven
	Trumbull Lake	4 miles West, 5 miles North of Ruthven
Clinton	Kildeer and Malone	4 miles East of DeWitt
Crawford	Ahart/Rudd Natural Resource Area	2 miles South of Dow City, S21, T82N, R40W
	Nelson Park Lake	3 miles West, 3 miles North of Dow City
	Yellow Smoke Park	2 miles East, 2 miles North of Denison
Dallas	Beaver	1½ miles North of Dexter
Davis	Lake Fisher	2 miles Northwest of Bloomfield
	Lake Wapello	7 miles West of Drakesville

Decatur	Little River Watershed Lake	1 mile West of Leon
	Nine Eagles Lake	3½ miles Southeast of Davis City
	Slip Bluff Lake	2 miles Northwest of Davis City
Delaware	Backbone Lake	4 miles Southwest of Strawberry Point
	Lake Delhi	3 miles West of Delhi
	Quaker Mills Impoundment	Northwest edge of Manchester
	Silver Lake	Southeast edge of Delhi
Des Moines	Fourth Pumping Plant	6 miles North, 5 miles East of Kingston
Dickinson	Center Lake	2 miles West, ½ mile South of Spirit Lake
	Diamond	2 miles East, 2 miles North of Montgomery
	East Okoboji Lake	East edge of Okoboji
	Gar (Lower)	½ mile South of Arnolds Park
	Gar (Upper)	East of Arnolds Park
	Little Spirit Lake	4 miles North of Orleans
	Minnewashta	½ mile South of Arnolds Park
	Silver	West Edge of Lake Park
	Spirit Lake	1 mile North of Spirit Lake
	Swan Lake	2 miles North of Superior
	West Okoboji Lake	Northwest edge of Arnolds Park
Dubuque	Heritage Pond	2 miles North of Dubuque
Emmet	High Lake	6 miles East of Wallingford
	Ingham Lake	6 miles East of Wallingford
	Iowa Lake	6 miles North of Armstrong
	Tuttle Lake	1 mile East, 2 miles North of Dolliver
	West Swan	1½ miles South, 2 miles East of Gruver
Fayette	Lake Oelwein	Oelwein
	Volga Lake	3 miles North of Fayette
Franklin	Beeds Lake	2 miles West, 1 mile North of Hampton
	Interstate Park Pond	1 mile West, 2 miles South I-35 & Hwy. 3
	Maynes Grove Lake	4 miles South of Hampton on Hwy. 65
Fremont	McPaul “A”	2 miles South of Bartlett
	McPaul “B”	2 miles South of Bartlett
	Percival Lake	1 mile North of Percival
	Scott Lake “A”	1½ miles South of Bartlett

Greene	Spring Lake	4 miles Northwest of Grand Junction
Guthrie	Springbrook	7 miles North of Guthrie Center
Hamilton	Andersen Lake/Marsh	1 Mile East of Jewell
	Bjorkboda Marsh	S36, T86N, R26W
	Briggs Wood Lake	2 miles South of Webster City
	Gordons Marsh	S33 and 34, T88N, R26W
	Little Wall Lake	1½ miles South of Jewell
Hancock	Crystal Lake	North edge of Crystal Lake
	Eagle Lake	3 miles Northeast of Britt
	Eldred Sherwood Lake	3 miles East, 1 mile North of Goodell
	West Twin Lake	3 miles East of Kanawha
Hardin	Pine Lake (Lower)	½ mile East of Eldora
	Pine Lake (Upper)	½ mile East of Eldora
Harrison	DeSoto Bend	5 miles West of Missouri Valley
	Willow Lake	5½ miles West of Woodbine
Henry	City of Westwood Pond	S11, T71N, R7W
	Crane's Pond	Mt. Pleasant
	East Lake Park Pond	Mt. Pleasant
	Geode Lake	4 miles Southwest of Danville
	Gibson Park Pond	S28, T71N, R7W
Howard	Lake Hendricks	½ mile Northeast of Riceville
Ida	Crawford Creek	3½ miles South of Battle Creek
	Moorehead Park Pond	½ mile North of Ida Grove
Iowa	Iowa Lake	5 miles North of Millersburg
Jackson	Green Island Lakes	1 mile East of Green Island
	Middle Sabula Lake	West edge of Sabula
Jasper	Mariposa Lake	5 miles Northeast of Newton
	Rock Creek Lake	4 miles Northeast of Kellogg
Johnson	Coralville Reservoir	4 miles North of Iowa City
	Kent Park Lake	2½ miles West of Tiffin
	Lake Macbride	4 miles West of Solon

Jones	Central Park Lake	2 miles West of Center Junction
Keokuk	Belva Deer Ponds (4)	5 miles Northeast of Sigourney
	Yen-Ruo-Gis	2 miles North of Sigourney
Kossuth	Burt Lake	4 miles West, 8 miles North of Swea City
	Smith	3 miles North of Algona
Lee	Chatfield Lake	3 miles Northwest of Keokuk
	Pollmiller Park Lake	½ mile East of West Point
	Shimek Forest Ponds (4)	1 mile East of Farmington
Linn	Pleasant Creek Lake	4 miles North of Palo
Louisa	Cone Marsh	10 miles Northwest of Columbus Jct.
	Indian Slough	4 miles Northwest of Wapello
	Iowa Slough	3 miles Southeast of Oakville
	Lake Odessa	5 miles East of Wapello
Lucas	Brown's Slough	7 miles Southeast of Russell
	Colyn North	4 miles South of Russell
	Colyn South	4 miles South of Russell
	Ellis Lake	1 mile East of Chariton
	Morris Lake	3 miles East of Chariton
	Red Haw Lake	1 mile East of Chariton
	Stephens Forest Ponds #1 & #2	3 miles Southwest of Lucas
	Williamson Pond	2 miles East of Williamson
Lyon	Fairview Pond	5 miles South, 3 miles West of Inwood
	Lake Pahoja	4 miles South, 2 miles West of Larchwood
Madison	Badger Creek Lake	5 miles Southeast of Van Meter
	Winterset City Reservoir	2 miles Northeast of Winterset
Mahaska	Hawthorne Lake	1 mile South of Barnes City
	Lake Keomah	6 miles East of Oskaloosa
	White Oak Lake	3 miles South of Rose Hill
Marion	Red Rock	4 miles North of Knoxville
	Roberts Creek	6 miles Northeast of Knoxville
	Roberts Creek Lake	S28, 29, 33 and 34, Summit Twp.
Marshall	Green Castle Lake	1 mile South of Ferguson

Mills	Folsom Lake	2 miles West of Glenwood
	Keg Creek Lake	2 miles Southwest of Pacific Junction
	Mile Hill Lake	2 miles West of Glenwood
	P.J. Lake	1 mile Southwest of Pacific Junction
	Pony Creek Lake	3½ miles Northwest of Glenwood
Mitchell	Interstate Park	West edge of Mitchell
Monona	Blue Lake	3 miles West of Onawa
	Johnston Pit	1 mile East of Rodney
	McDonald Pit	1 mile East of Rodney
	Oldham Lake	1 mile North of Soldier
	Peters Park Pond	1 mile East of Rodney
	Savery	2 miles Southeast of Moorhead
	Utterback Pond	3 miles North, 3 miles West of Castana
Monroe	Albia (Upper)	1 mile North of Albia
	Albia (Lower)	1 mile North of Albia
	Cottonwood Pits	2 miles South of Albia
	Lattart	4 miles Southwest of Lovilla
	Lake Miami	5 miles Southeast of Lovilla
Montgomery	Hacklebarney East	4 miles North of Villisca
	Viking Lake	4 miles East of Stanton
Muscatine	Cone Lake	1½ miles East of Conesville
	Wiese Slough	2 miles Southeast of Atalissa
O'Brien	Dog Creek Lake	2 miles East, ½ mile South of Sutherland
	Douma Area Park Pond	2 miles West, 1 mile South of Sanborn
	Hagan Wildlife Pond	S13, T95N, R41W
	Mill Creek Lake	1 mile East of Paullina
	Negus Wildlife Area Pond	S30, T94N, R39W
	Tjossem Park Ponds	S6, T95N, R40W
Osceola	Ashton Park Lake	S14, T98N, R42W
	Ashton Pits Access Area	S11, T98N, R42W
	Iowa Lake	S9, T100N, R39W
	Leinen Pits	S25, T99N, R42W
	May City Pit	S5, T98N, R39W
	Ocheyedan Pits	2 miles South of Ocheyedan
	Peters Pits	S19, T100N, R42W
	Thomas Pit	S36, T99N, R40W
	Willow Creek Lake	S31, T100N, R40W
Page	Pierce Creek Lake/Pond	5 miles North of Shenandoah
	Ross Area	8 miles Southeast of Clarinda

Palo Alto	Five Island Lake	North edge of Emmetsburg
	Lost Island Lake	3 miles North of Ruthven
	Rush Lake	9 miles West of Mallard
	Silver Lake	2 miles West of Ayrshire
	Virgin Lake	2 miles South of Ruthven
Plymouth	Deer Creek	11 miles West, 1 mile South, 1½ miles West of Merrill
	Hillview Lake	1 mile Northwest of Hinton
	Silver Maple Primitive Area Lake	3 miles Southeast of Akron
	Southeast Wildwood Park Pond	3 miles Northeast of Kingsley
Polk	Big Creek Lake	2 miles North of Polk City
	Bondurant	Northeast edge of Bondurant
	Carney Marsh	Ankeny
	Case's Lake	Des Moines, S13, T78N, R24W
	Dale Maffitt Reservoir	6 miles Southwest of Des Moines
	Easter Lake Park	Southeast edge of Des Moines
	Engledinger Marsh	6 miles Northwest of Bondurant
	Ft. Des Moines Pond	South edge of Des Moines
	Grays Lake	Fleur Dr., Des Moines
	Saylorville Reservoir	North edge of Des Moines
	Skull Pond	Jester Park near Polk City
	Teal Pond	Jester Park near Polk City
	Thomas Mitchell Park Pond	2 miles Southwest of Mitchellville
	Two Dam Pond	Jester Park near Polk City
	Yellow Banks Park Pond	4 miles Southeast of Pleasant Hill
Pottawattamie	Arrowhead Pond	1½ miles Southeast of Neola
	Carter Lake	Carter Lake
	Lake Manawa	Southwest edge of Council Bluffs
Poweshiek	Arbor Lake	Grinnell
	Diamond Lake	1 mile West of Montezuma
Ringgold	Loch Ayr	2 miles North of Mt. Ayr
	Old Reservoir	½ mile North of Mt. Ayr
	Walnut Creek Marsh	5 miles Southwest of Mt. Ayr
Sac	Arrowhead Lake	South Side of Lake View
	Black Hawk Lake	East edge of Lake View
	Black Hawk Pits	1½ miles South of Lake View
Scott	Crow Creek	East edge of Mt. Joy
	West Park Lakes (4)	¼ mile West of Davenport

Shelby	Mantano Park Pond	8 miles Northwest of Defiance
	Prairie Rose	8 miles Southeast of Harlan
Story	Dakin's Lake	½ mile North of Zearing
	Hendrickson Marsh	3 miles Northeast of Collins
	Hickory Grove Lake	3 miles Southwest of Colo
	McFarland Lake	4 miles Northeast of Ames
	Peterson Pits	4 miles Northeast of Ames
Tama	Casey Lake	7 miles North of Dysart
	Otter Creek Lake	6 miles Northeast of Toledo
	Union Grove Lake	4 miles South of Gladbrook
Taylor	East Lake	½ mile North of Lenox
	Lake of Three Fires	3 miles Northeast of Bedford
	West Lake	1 mile North of Lenox
	Wilson Park Lake	2½ miles Southeast of Lenox
	Windmill Lake	3½ miles East of New Market
Union	Afton City Reservoir	1 mile West of Afton
	Green Valley Lake	2½ miles Northwest of Creston
	Summitt Lake	West edge of Creston
	Three Mile Creek Lake	East of Creston
	Twelve Mile Creek Lake	4 miles East of Creston
Van Buren	Indian Lake	1 mile Southwest of Farmington
	Lacey-Keosauqua Park Lake	1 mile Southwest of Keosauqua
	Lake Miss-Tug Fork W	5 miles Southwest of Keosauqua
	Lake Sugema	3 miles Southwest of Keosauqua
	Piper's Pond-Tug Fork E	5 miles Southwest of Keosauqua
Wapello	Arrowhead Lake	3 miles Southeast of Ottumwa
	Ottumwa Reservoir	Ottumwa
Warren	Banner Pits	4½ miles North of Indianola
	Lake Ahquabi	5 miles Southwest of Indianola
Washington	Lake Darling	3 miles West of Brighton
Wayne	Bob White Lake	1 mile West of Allerton
	Corydon Reservoir	West edge of Corydon
	Humeston Reservoir	1 mile North of Humeston
	Lineville Reservoir	North edge of Lineville
	Medicine Creek Wildlife Area Complex	6 miles East of Lineville
	Seymour Reservoir	½ mile South of Seymour

Webster	Badger Lake	4½ miles North of Fort Dodge
	Brushy Creek Lake	5 miles Northeast of Lehigh
Winnebago	Ambrosson Pits	3½ miles North of Forest City
	Lake Catherine	6 miles West of Forest City
	Rice Lake	1 mile South, 1 mile East of Lake Mills
Winneshiek	Lake Meyers	3 miles Southwest of Calmar
Woodbury	Bacon Creek	East edge of Sioux City
	Browns Lake	2 miles West of Salix
	Little Sioux Park Lake	2 miles South of Correctionville
	Snyder Bend Lake	1½ miles West of Salix
	Southwood	½ mile West, ½ mile South of Smithland
Worth	Kuennen's Pit	2 miles South, ½ mile East of Northwood
	Silver Lake	10 miles West, 3½ miles North of Northwood
Wright	Lake Cornelia	3½ miles North, 2 miles East of Clarion
	Morse Lake	3½ miles West of Belmond
	Wall Lake	10 miles Southeast of Clarion

TABLE 3
Annual Pounds of Nitrogen Per Space of Capacity

Swine	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Nursery, 25 lb.	1 head	2	1	5
Grow-finish, 150 lb.				
Formed storage*				
Dry feeders	1 head	21		29
Wet/dry feeders	1 head	23		29
Earthen storage**	1 head	14		29
Lagoon***	1 head		6	29
Gestation, 400 lb.	1 head	14	5	39
Sow & Litter, 450 lb.	1 crate	32	11	86
Farrow-nursery	Per sow in breeding herd	22	8	85
Farrow-finish	Per sow in breeding herd	150	44	172

Dairy, Confined	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Cows, 1200 & up lb.	1 head	129	59	239
Heifers, 900 lb.	1 head	97	44	179
Calves, 500 lb.	1 head	54	24	100
Veal calves, 250 lb.	1 head	27	12	50
Dairy herd	Per productive cow in herd	203	87	393

Beef, Confined	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Mature cows, 1000 lb.	1 head	105	23	147
Finishing, 900 lb.	1 head	95	19	132
Feeder calves, 500 lb.	1 head	53	11	73

Poultry	Space	Dry Manure
Layer, cages	1000 head	367
Broiler, litter	1000 head	585
Turkeys, litter	1000 head	1400

* Formed manure storage structure
** Earthen manure storage basin
*** Anaerobic lagoon

TABLE 4
Crop Nitrogen Usage Rate Factors

Corn	Zone 1	0.9 lbs/bu	Orchard grass	38.0 lbs/ton
	Zone 2	1.1 lbs/bu	Tall fescue	38.0 lbs/ton
	Zone 3	1.2 lbs/bu	Switch grass	21.0 lbs/ton
Corn silage		7.5 lbs/ton	Vetch	56.0 lbs/ton
Soybeans		3.8 lbs/bu	Red clover	43.0 lbs/ton
Oats		0.75 lbs/bu	Perennial rye grass	24.0 lbs/ton
Alfalfa		50.0 lbs/ton	Timothy	25.0 lbs/ton
Wheat		1.3 lbs/bu	Wheat straw	13.0 lbs/ton
Smooth brome		40.0 lbs/ton	Oat straw	12.0 lbs/ton
Sorghum or Sudan grass		40.0 lbs/ton		

The following map outlines the three zones for the corn nitrogen usage rates indicated in the Table 4. Zone 1 corresponds to the Moody soil association. Zone 2 corresponds to the Marshall, Monona-Ida-Hamburg, and Galva-Primghar-Sac soil associations. Zone 3 corresponds to the remaining soil associations.

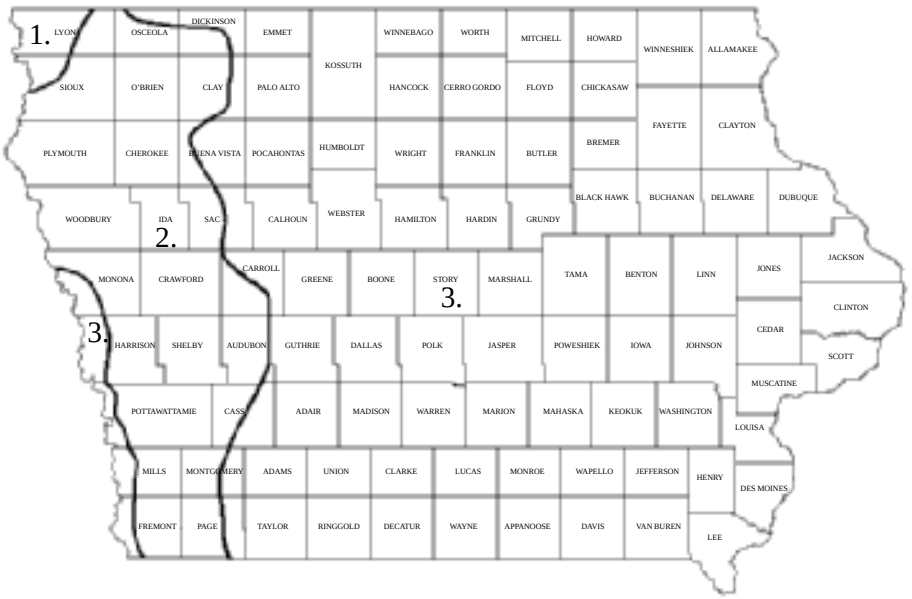

TABLE 5
Manure Production Per Space of Capacity

		Daily		Yearly
Swine	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Nursery, 25 lb.	1 head	0.2 gal	0.7 gal	0.34 tons
Grow-finish, 150 lb.				
Formed storage*				
Dry feeders	1 head	1.2 gal		2.05 tons
Wet/dry feeders	1 head	0.84 gal		2.05 tons
Earthen storage**	1 head	1.2 gal		2.05 tons
Lagoon***	1 head		4.1 gal	2.05 tons
Gestation, 400 lb.	1 head	1.6 gal	3.7 gal	2.77 tons
Sow & Litter, 450 lb.	1 crate	3.5 gal	7.5 gal	6.16 tons
Farrow-nursery	Per sow in breeding herd	2.2 gal	5.4 gal	6.09 tons
Farrow-finish	Per sow in breeding herd	9.4 gal	30 gal	12.25 tons

Dairy, Confined	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Cows, 1200 & up lb.	1 head	11.8 gal	40.1 gal	19.93 tons
Heifers, 900 lb.	1 head	8.8 gal	29.9 gal	14.95 tons
Calves, 500 lb.	1 head	4.9 gal	16.5 gal	8.30 tons
Veal calves, 250 lb.	1 head	2.5 gal	8.2 gal	4.15 tons
Dairy herd	Per productive cow in herd	18.5 gal	59.8 gal	32.77 tons

Beef, Confined	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Mature cows, 1000 lb.	1 head	7.2 gal	15.7 gal	12.23 tons
Finishing, 900 lb.	1 head	6.5 gal	13.1 gal	11.00 tons
Feeder calves, 500 lb.	1 head	3.6 gal	7.3 gal	6.11 tons

Poultry	Space	Dry Manure
Layer, cages	1000 head	10.5 tons
Broiler, litter	1000 head	9.00 tons
Turkeys, litter	1000 head	35.00 tons

* Formed manure storage structure
** Earthen manure storage basin
*** Anaerobic lagoon

TABLE 6
Required Separation Distances—Swine, Sheep, Horses and Poultry

DISTANCES TO BUILDINGS AND PUBLIC USE AREAS				
Type of Structure	Animal Weight Capacity (lbs.)	Residences, Businesses, Churches, Schools		Public Use Areas
		Unincorporated Areas	Incorporated Areas	
Anaerobic lagoons and uncovered earthen manure storage basins	<200,000	1,250 feet	1,250 feet	1,250 feet
	200,000 to <625,000	1,250 feet	1,250 feet	1,250 feet
	625,000 to <1,250,000	1,875 feet	1,875 feet	1,875 feet
	1,250,000 or more	2,500 feet	2,500 feet	2,500 feet
Covered earthen manure storage basins	<200,000	1,000 feet	1,250 feet	1,250 feet
	200,000 to <625,000	1,000 feet	1,250 feet	1,250 feet
	625,000 to <1,250,000	1,250 feet	1,875 feet	1,875 feet
	1,250,000 or more	1,875 feet	2,500 feet	2,500 feet
Uncovered formed manure storage structures	<200,000	None	None	None
	200,000 to <625,000	1,250 feet	1,250 feet	1,250 feet
	625,000 to <1,250,000	1,500 feet	1,875 feet	1,875 feet
	1,250,000 or more	2,000 feet	2,500 feet	2,500 feet
Confinement buildings and covered formed manure storage structures	<200,000	None	None	None
	200,000 to <625,000	1,000 feet	1,250 feet	1,250 feet
	625,000 to <1,250,000	1,250 feet	1,875 feet	1,875 feet
	1,250,000 or more	1,875 feet	2,500 feet	2,500 feet
Egg washwater storage structures	<200,000	None	None	None
	200,000 to <625,000	750 feet	1,250 feet	1,250 feet
	625,000 to <1,250,000	1,000 feet	1,875 feet	1,875 feet
	1,250,000 or more	1,500 feet	2,500 feet	2,500 feet

DISTANCES TO WELLS				
Type of Structure	Public Well		Private Well	
	Shallow	Deep	Shallow	Deep
Aerobic structure, anaerobic lagoon, earthen manure storage basin, egg washwater storage structure and open feedlot runoff control basin	1,000 feet	400 feet	400 feet	400 feet
Formed manure storage structure, confinement building, open feedlot solids settling facility and open feedlot	200 feet	100 feet	200 feet	100 feet

OTHER DISTANCES FOR ANIMAL FEEDING OPERATION STRUCTURES regardless of animal weight capacity	
Surface intake, wellhead or cistern of agricultural drainage wells, known sinkholes or major water sources (Excluding farm ponds, privately owned lakes or when a secondary containment barrier is provided)	500 feet
Watercourses other than major water sources (Excluding farm ponds, privately owned lakes or when a secondary containment barrier is provided)	200 feet
Right-of-way of a thoroughfare maintained by a political subdivision (Excluding small feeding operations, dry manure storage or when permanent vegetation is provided)	100 feet

See rule 567 IAC 65.12(455B) for exemptions available from the above distances

TABLE 7
Required Separation Distances—Beef and Dairy Cattle

DISTANCES TO BUILDINGS AND PUBLIC USE AREAS				
		Residences, Businesses, Churches, Schools		Public Use Areas
Type of Structure	Animal Weight Capacity (lbs.)	Unincorporated Areas	Incorporated Areas	
Anaerobic lagoons	<400,000	1,250 feet	1,250 feet	1,250 feet
and uncovered	400,000 to <1,600,000	1,250 feet	1,250 feet	1,250 feet
earthen manure	1,600,000 to <4,000,000	1,875 feet	1,875 feet	1,875 feet
storage basins	4,000,000 or more	2,500 feet	2,500 feet	2,500 feet
	<400,000	1,000 feet	1,250 feet	1,250 feet
Covered earthen	400,000 to <1,600,000	1,000 feet	1,250 feet	1,250 feet
manure storage	1,600,000 to <4,000,000	1,250 feet	1,875 feet	1,875 feet
basins	4,000,000 or more	1,875 feet	2,500 feet	2,500 feet
	<400,000	None	None	None
Uncovered formed	400,000 to <1,600,000	1,250 feet	1,250 feet	1,250 feet
manure storage	1,600,000 to <4,000,000	1,500 feet	1,875 feet	1,875 feet
structures	4,000,000 or more	2,000 feet	2,500 feet	2,500 feet
Confinement buildings	<400,000	None	None	None
and covered formed	400,000 to <1,600,000	1,000 feet	1,250 feet	1,250 feet
manure storage	1,600,000 to <4,000,000	1,250 feet	1,875 feet	1,875 feet
structures	4,000,000 or more	1,875 feet	2,500 feet	2,500 feet

DISTANCES TO WELLS				
	Public Well		Private Well	
Type of Structure	Shallow	Deep	Shallow	Deep
Aerobic structure, anaerobic lagoon, earthen manure storage basin, and open feedlot runoff control basin	1,000 feet	400 feet	400 feet	400 feet
Formed manure storage structure, confinement building, open feedlot solids settling facility and open feedlot	200 feet	100 feet	200 feet	100 feet

OTHER DISTANCES FOR ANIMAL FEEDING OPERATION STRUCTURES regardless of animal weight capacity	
Surface intake, wellhead or cistern of agricultural drainage wells, known sinkholes or major water sources (Excluding farm ponds, privately owned lakes or when a secondary containment barrier is provided)	500 feet
Watercourses other than major water sources (Excluding farm ponds, privately owned lakes or when a secondary containment barrier is provided)	200 feet
Right-of-way of a thoroughfare maintained by a political subdivision (Excluding small feeding operations, dry manure storage or when permanent vegetation is provided)	100 feet

See rule 567 IAC 65.12(455B) for exemptions available from the above distances

TABLE 8
Summary of Credit for Mechanical Aeration

	Pounds Volatile Solids per 1000 cubic feet			
% of Oxygen Supplied	Beef	Other than Beef		
	Daily max in all counties	Less than or equal to 6000 lb vs. daily max	Less than or equal to 6000 lb vs. daily max in counties listed in 65.15(13)"*b*"(2) above	Greater than 6000 lb vs. daily max in all counties
0-50	10.0	5.0	4.5	4.0
50	12.5	6.3	5.6	5.0
60	13.3	6.6	6.1	5.5
70	14.0	7.0	6.5	6.0
80	14.8	7.4	6.9	6.5
90	15.5	7.8	7.4	7.0
100	16.3	8.1	7.8	7.5
110	17.0	8.5	8.3	8.0
120	17.8	8.9	8.7	8.5
130	18.5	9.3	9.1	9.0
140	19.3	9.6	9.6	9.5
150	20.0	10.0	10.0	10.0